

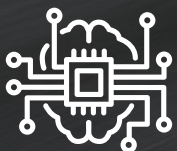
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Shaping the future of mobility

Industry viewpoints on connected and autonomous vehicles,
electric cars and alternative mobility solutions



Artificial
Intelligence



At a roundtable event in London in June 2018, CMS assembled a selection of automotive industry experts and key members of the CMS Autotech Group to discuss hot topics that sit at the crossroads of automotive technology (autotech) and artificial intelligence (AI). In this report, we capture the predictions for the industry and key obstacles that will need to be overcome.

Rapid developments in autotech – many of which are underpinned by AI – are challenging some of our fundamental assumptions about how society provides mobility solutions to consumers and businesses. This is changing the way in which we think about apportioning risk and liability in the automotive sector, the commercial and social models that we rely on for transportation, and the role that we envisage for smart infrastructure in shaping the future of mobility. These new AI-driven automotive technologies promise a range of benefits for business and society, but there are also significant challenges to be overcome on the road to mass adoption.

We explore these key issues in this report – I hope you find it interesting. If you require further information on any of the topics that it covers, please feel free to contact me.



Laurence Kalman

Partner, Co-Head of CMS Autotech Group

T +44 20 7067 3078

E laurence.kalman@cms-cmno.com

[@CMS_Autotech](#)

Vehicle safety and the changing risk landscape

One of the key benefits that autonomous vehicles (AVs) have the potential to deliver is significantly improved vehicle safety. Far fewer accidents will happen in a world dominated by AVs, but unfortunately this will not be achieved immediately.

In March 2018, the State of Arizona ordered Uber Technologies to stop testing AVs on its roads; this followed the death of a woman caused by a collision with one of its vehicles in the city of Tempe. It was a tragic incident, though many observers would point to the far greater dangers posed by conventional vehicles. According to the European Commission, some 25,600 people died on European Union (EU) roads in 2016, the vast majority of accidents caused by human actions rather than vehicle faults. General fatigue, alcohol-induced impairment, mobile phone use and many other factors contribute to thousands of incidents that are attributable to drivers themselves.

Inevitably AVs will cause accidents along the way, but they are expected to make travel dramatically safer in the longer term. *"We are on a journey to safer streets,"* comments Laurence Kalman, a partner in the Technology team and co-head of the Autotech Group at CMS. He believes that regulation in this area should balance the desire to encourage innovation with the need to appropriately manage risks.



We are on a journey to safer streets.

Laurence Kalman, CMS



But will AVs really make our roads safer?

History tells us that there is often a price to pay for innovation. The death of William Huskisson, the MP for Liverpool, in 1825 could have halted the evolution of rail travel; he was hit and fatally wounded by the Rocket, George Stephenson's pioneering locomotive.

Huskisson's death did not stop rail travel from revolutionising transportation. Similarly, accidents involving AVs are unlikely to disrupt this new wave of transportation innovation on a permanent basis. The European Commission's report *Europe on the Move*, which was published in May 2018, says: *'The objective is to allow all Europeans to benefit from safer traffic, less polluting vehicles and more advanced technological solutions, while supporting the competitiveness of the EU industry.'* In the report, Elżbieta Bieńkowska, the Commissioner for Internal Market, Industry, Entrepreneurship and SMEs, states: *"90% of road accidents are due to human error. The new mandatory safety features we propose today will reduce the number of accidents and pave the way for a driverless future of connected and automated driving."*

An initial report by the National Transportation Safety Board on the Uber crash in Tempe said that the car had detected the pedestrian, possibly six seconds before the collision, but its emergency braking systems had been deliberately disabled to *"reduce the potential for erratic vehicle behaviour"*, according to Uber. The company said: *"The vehicle operator is relied on to intervene and take action. The system is not designed to alert the operator."* So was this actually another example of human error being to blame?

At the CMS roundtable, Tony Lynch, the CEO and founder of Fari, the car pooling platform, suggested that automated driving should not be held back by safety concerns: *"360-degree awareness of other vehicles and pedestrians must be a massive benefit."* Lynch, who cycles to work, says that too many drivers are still distracted by using their mobile phones.

90%

of road accidents are due to human error

Elżbieta Bieńkowska, the Commissioner for Internal Market, Industry, Entrepreneurship and SMEs.

Liability – what happens when things go wrong?

The advent of AVs will be staged, with a gradual increase of autonomous features until the vehicle is in total control with no driver intervention. This creates complexities when assessing an incident and determining where liability is to be apportioned.

“Current insurance legislation assumes that the driver is insured,” says Chris Watson, CMS’s Head of Technology, Media and Communications. *“The easiest thing for the industry to do in the medium term is to assume that since you are driving, it is your responsibility,”* says Louis Glass, co-head of technology for the Corporate group at CMS.

“Premiums will likely stay the same until very high or full autonomy is very well established indeed and the insurers can more easily price in the (hopefully) positive safety benefits of autonomous driving.”



In the UK, the Automated and Electric Vehicles Act 2018 maintains a 'single insurer' model, under which insurers will be required to cover automated vehicles being used in autonomous mode. In general, anyone who suffers damage or injury will be entitled to claim compensation from the insurer. The

insurer may then be able to recover its losses from any other person who is liable under existing product liability rules or other principles, potentially including the vehicle manufacturer, a software provider or a hardware supplier.

Summary of SAE International's levels of driving automation

SAE level	Label	Description
Driver is primarily responsible for monitoring the environment		
0	No automation	Vehicle relies on human driver to perform all tasks (although it may be enhanced e.g. by warning systems).
1	Driver assistance	Vehicle performs automated steering OR acceleration / deceleration; driver performs all other driving tasks. Examples include adaptive cruise control, automatic emergency braking and lane keeping assist.
2	Partial automation	Vehicle performs automated steering AND acceleration / deceleration; driver performs all other driving tasks and must be ready to intervene immediately at any time. May include driver assistance systems under level 1, plus (for example) more sophisticated parking assistance systems. Systems like Tesla Autopilot, Volvo Pilot Assist and Mercedes-Benz Drive Pilot are generally considered level 2.
Vehicle is primarily responsible for monitoring the environment		
3	Conditional automation	Vehicle performs all operational and tactical driving tasks under certain circumstances. Driver can fully disengage but must respond to a request to intervene within a set period of time.
4	High automation	Vehicle performs all operational and tactical driving tasks under certain circumstances, even if driver does not respond to a request to intervene (in which case vehicle must handle the situation itself). Driver can fully disengage but still able to request control.
5	Full automation	Vehicle performs all operational and tactical driving tasks under ALL circumstances. No human control is required.

As vehicles become more reliant on AI, and with drivers relinquishing the controls, the liability picture therefore starts to become murkier. This helps to explain why a number of car manufacturers are bypassing level 3 automation, where a driver can turn his or her attention away from driving tasks, but must be prepared to intervene when called upon by the vehicle to do so. Some manufacturers believe that this is a troubling middle ground, where drivers' attention will drift, leaving them poorly positioned to intervene quickly if necessary.

Aston Martin is aiming for level 4 autonomy with the development of its new line of Lagondas. At the CMS roundtable, Nick Lines, Vice President and Chief Planning Officer at Aston Martin, said that that even sports car enthusiasts will enjoy handing over the

controls to the vehicle at times: *"Degrees of autonomy in certain circumstances will come. Even in a sports car, driving in a traffic jam or on a motorway is boring."* Lines added that he believes that OEMs will automatically take on greater liability as drivers assume less control. Claimants will inevitably look to manufacturers and their deep pockets. Gemma Lampert, a partner in CMS's UK Dispute Resolution group, believes that manufacturers and their partners will have to consider the possibility of more serious collisions, including motorway pile-ups, where their technology or technologies may be at fault. As well as shaking up the vehicle insurance industry, these developments will generate significant points for negotiation in the partnerships that will continue to emerge between manufacturers, suppliers and other players over the coming years.

Mobility solutions and the decline in vehicle ownership

The direction of development for automated and electric vehicles remains uncertain, as does the speed at which they will penetrate the market. Consumer demand is unpredictable and many believe there will be a move away from vehicle ownership towards alternative solutions. The sharing economy is of course a huge factor in the development of mobility and some think this could radically reduce the number of vehicles on the road.

It will also create a demand for integrated modes of transport as manufacturers and service providers attempt to establish brands and secure customer loyalty. Tony Lynch (Faxi) believes that the big data companies such as Google will be well-positioned to take a pivotal role in this new economy: *"They'll know where I travel and what the fastest route is"*.

Niranjan Thiyagarajan, Senior Consultant focused on the Future of Mobility at Monitor Deloitte, who does not own a car but drives one from a car sharing scheme, believes that Mobility-as-a-Service (MaaS) will become increasingly popular. He describes a model where integrated modes of transport (e.g. bike, bus, car) will enable travellers to efficiently journey from A to B.

"Will vehicle ownership exist in 10 to 15 years?" Laurence Kalman (CMS) asks. *"It may be viewed as very expensive to have a capital asset sitting in the garage for most of the time."*

Clearly where demand is high and where the infrastructure is available, such as in cities, MaaS is likely to gain greater traction. That said, Chris Watson (CMS) that MaaS also has great potential to service rural areas, where transport services are lacking: *"Micro-economies can be served on a demand driven basis and it is also scalable. This is really interesting."*



They'll [big data companies] know where I travel and what the fastest route is.

Tony Lynch, CEO and Founder of Faxi





Networks and data – connecting for success

For connected and autonomous vehicles (CAVs) to succeed and penetrate the market, they must be given the right infrastructure to operate. The key issues, according to David Wong (SMMT) are coverage, bandwidth and capacity.

David Wong, Senior Technology and Innovation Manager at the Society of Motor Manufacturers and Traders (SMMT), the UK's automotive industry trade body, suggests that coverage remains the main obstacle. This is because the 4G network in the UK remains comparatively poor outside densely populated urban areas and even 3G coverage is far from ubiquitous on the UK road network. Only 18% of roads in the UK have 4G coverage and, with no in-country roaming, there remains the problem of switching between networks.

Bandwidth continues to be a problem with the advent of 5G expected to be the breakthrough moment for CAVs, though the extent of 5G coverage will also be absolutely pivotal.

Vehicle to vehicle (V2V) and vehicle to infrastructure (V2i) communication technologies will also enable use of CAVs, particularly on motorways and main roads, but it is unlikely that these can be extended to

the entire road network. Where these technologies are absent, it could be that CAVs then transfer to 4G or 5G.

The vast increases in vehicle connectivity that are expected to take place will generate new risks of their own. Security and privacy concerns will obviously be raised whenever vehicles are connected to networks and to each other. Cyber criminals will inevitably target the weakest components in the ecosystem and have the potential to do tremendous damage.

“Connected and autonomous vehicles will gather a wealth of data about individuals,” Caroline Cooper, an Associate in the Technology and Data Protection team at CMS comments, making them prime targets for hackers. *“Taking cyber security and data privacy concerns seriously is going to be key to gaining consumers’ trust and succeeding in this sector.”* One OEM at the CMS roundtable, recognising this area as a real battleground, has a dedicated cyber security department.



Taking cyber security and data privacy concerns seriously is going to be key to gaining consumer trust and succeeding in this sector.

Caroline Cooper, CMS

Powering the transport and mobility economy

While CAV technologies are reaching our streets in an incremental way, industry and government are both hitting the accelerator on the path towards electric vehicles. The UK will ban the sale of new combustion engine vehicles from 2040 onwards, though campaigners, such as the Green Alliance, want that date to be brought forward. Richard Branson recently called for a ban on new petrol and diesel cars from 2025. Undeniably, electric vehicles are becoming more prevalent as the traditional combustion engine is phased out.

There are more than 37,000 registered electric vehicles in the UK, according to Cap HPI. Yet limited vehicle battery life and extended charging time remains a key concern for those looking to travel longer distances.

Battery technology, though, is rapidly improving. Drivers in Formula E, the motor racing championship using electric-powered cars, have previously been forced to switch cars mid race, because of limited battery life. However, in the 2018/2019 season, Formula E will launch a second generation vehicle that will no longer require mid-race car swaps.

The vision for an ultra-low emission economy by 2040 will demand a significant upgrade in the number of charging points for electric vehicles. The Government's Committee on Climate Change says some 60% of cars and

vans will be electricity powered by 2030. The Committee states that *"nearly 29,000 charging points are needed across Great Britain by 2030 to meet future EV charging needs"*.

The Committee also emphasises the need for long distance rapid charging points, which should increase from 460 in 2016 to 1,170 by 2030. Charging point compatibility and interoperability for a variety of vehicles and customers will be pivotal to universal access. *"We need to make charging as easy as rocking up to the traditional petrol station forecourt,"* says David Wong (SMMT) at the CMS roundtable.

Dynamic and inductive charging may well provide a viable part of the solution where governments, authorities or private manufacturers are willing to make the infrastructure investment.

Nearly
29,000

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Examples of this include vehicle manufacturer Renault, which is trialling an under-road charging strip in France, enabling car batteries to charge while the vehicle is on the move. Just outside Stockholm, an electrified road with some 2km of electric rail set into the surface allows vehicle batteries to recharge on the go. Wireless inductive charging is generating a great deal of global interest, including for taxi ranks where vehicles will often sit idle.

With declining use of fossil fuels to power vehicles and the shift to electric, there is a risk of a significant future shortfall in electricity supply. Powering this new breed of vehicle poses a significant challenge even if charging points and wireless dynamic charging become available.

National Grid estimates that, by 2050, electric vehicles will create an annual demand of 46TWh, some 11% of national demand.

A significant uptick in power output would solve at least part of the problem, though David Wong (SMMT) notes that “most problems are, at least in the near-to-medium term, distributional problems” and that

balancing the grid could be just as effective as building more power plants. Recognising that the population requires power at different times, electricity could potentially be redistributed based on current demand. Nuvve, a San Diego-based business, has developed a “Grid Integrated Vehicle Platform” to allow idle EVs to share power with the network and operate as “grid assets”. At the same time, vehicle users/owners always have sufficient charge when required. By aggregating thousands of EVs, they are turned into a “virtual power plant”. AI-based technologies will be able to predict power use based on customer habits and can be connected to calendar events to ensure that additional power is available for longer journeys.

In its paper entitled *Electric Dreams: The Future for EVs*, National Grid says: “Solutions lie in a combination of incentives to encourage off-peak charging and smart systems that make the process of charging itself as simple and automated as possible. Consumers would likely be just a couple of clicks on an app away from getting the whole thing done with the minimum of fuss.”



We need to make charging as easy as rocking up to the traditional petrol station forecourt.

David Wong, Senior Technology and Innovation Manager, SMMT



So who will win the race?

Industry disruptors, like Tesla, are already challenging traditional vehicle manufacturers. With sales of 29,980 vehicles in the first quarter of 2018, according to Statista, they have achieved considerable traction. Legacy OEMs face a tough challenge to maintain or grow market share in unconventional circumstances where consumers are more likely to access a variety of transport modes.

Some manufacturers are responding by seeking to provide an 'end-to-end' travel experience for customers. Ford has launched Ford GoBikes, as part of the San Francisco Bay Area's bike-share infrastructure. It also acquired Chariot, the San Francisco shuttle bus startup, to enable it to offer a wider range of mobility solutions.

"Whoever owns the customer, wins the battle," says one industry expert at the CMS roundtable, suggesting that many traditional car manufacturers should have this kind of initiative at the top of their strategic agendas.

This is worth further attention if, as many expect, consumers start to choose brands based less on the driving experience and more based on practicalities and coverage. *"Most people won't care what car they are in unless it is one of the premium brands,"* comments John Savage of the Fiat Chrysler Automobiles group.

One of the major advantages that the AI and data giants enjoy in the quest to dominate this space is that they already provide services to such a high proportion of the population and understand their transportation habits and requirements. Google, for example, could easily leverage its data assets to predict a customer's travel needs and the amount of power required to complete a journey. *"The battle for*

autonomous driving is unlikely to be lost by the tech conglomerates," says Guillaume Bonneton, a partner at GP Bullhound, a leading technology advisory and investment firm.

On the other side of the debate, some argue that traditional vehicle manufacturers will maintain or even increase market share, particularly if the market moves towards commoditisation. Tesla has been able to sustain a massive level of investment in its technologies, but other new entrants do not necessarily have the financial muscle to absorb losses as they build up their market position. One senior industry adviser at the CMS roundtable commented: *"Car manufacturers have been building cars for decades and will eat the new players for breakfast. They can re-purpose their businesses and blow others out of the water by leveraging their experience and supply chains."*

Time will tell which side of the argument wins out. In any event the next few years will be a fascinating time for the automotive industry and for mobility in general, as AI and other technologies increasingly disrupt the traditional models in this sector. We look forward to continuing to engage with leading autotech and AI players on these crucial issues as the debates unfold.



Whoever owns the customer, wins the battle.

Industry expert at CMS roundtable



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CMS Cameron McKenna Nabarro Olswang LLP
Cannon Place
78 Cannon Street
London EC4N 6AF

T +44 (0)20 7367 3000
F +44 (0)20 7367 2000

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